Appendix B.

Scope of Work for Field Survey

Upper Mississippi River and Illinois Waterway
Streambank Erosion Study
Scope of Work

I. Objectives

The main objectives of this study will be to review information provided by the COE including oblique aerial video photography, conduct a field reconnaissance survey by boat, gather photos, identify bank erosion on navigation charts, obtain cross-section and soil data from the selected sites, and classify the bank erosion sites following a system of classification attributes. Opinions as to the relative significance of bank erosion due to various factors such as hydraulics of flow and waves generated by commercial and/or recreational traffic and wind will be provided. Finally, about five (5) sites will be selected for future field experimentation based on the field visit. All the data thus gathered and/or measured will be put into a data base. A final report is to be prepared incorporating all the work described here.

II. Scope

The scope of this work is to identify and describe reach of riverbank conditions and bank erosion sites on the entire Upper Mississippi River System including the Illinois Waterway. It is also designed to identify the major erosion areas, inventory those bank sites, provide opinions as to the erosion and failure mechanisms at each location, and identify the bank soils. The study reach for this work will consist of the Upper Mississippi River from the confluence of the Ohio River at Mile 0 to the Upper St. Anthony Falls Lock at Mile 854 and the Illinois Waterway from Mile 0 at Grafton, IL to Mile 286 at Joliet, IL.

The basic data collection will include but will not be limited to procedures outlined by Bhowmik et al. (1990). Other reference documents that will be used are those given by Bhowmik and Schicht (1980) and Hagerty (1988).

The contractor will be required to coordinate all work with a multi-disciplinary team of individuals to be selected jointly by the COE and the contractor to produce a report such that conclusions and recommendations are reached in a collaborative effort between the contractor and the multi-disciplinary team. This team of individuals will provide input throughout the study process including, but not limited to, the field reconnaissance and the report preparation. The contractor will serve as the focal point of this multi-disciplinary team and will be responsible for ensuring that the field reconnaissance and study results are inclusive of conclusions of both the contractor and the multi-disciplinary team.
The following section outline the work items and tasks for this contract.

III. Tasks

Task 1. Review of Literature: Review the bank erosion literature survey conducted by the Waterways Experiment Station (Maynord and Martin, 1995). Review the previous reports on the Illinois Waterway prepared by Bhowmik and Schicht (1980) and Hagerty (1988).

Task 2. Develop Classification System: All significant bank erosion sites and especially the 60 sites to be selected for detailed investigations will be classified based on the following parameters.

Site Location
- River
- Navigation Pool
- Right or left descending bank
- Upstream river mile
- Downstream river mile
- Upstream UTM coordinates
- Downstream UTM coordinates

Site Attributes (limited to selected erosion sites only)

Anthropic character
- Natural bank or revetted bank
- Wing dam(s) present or absent (from navigation charts)
- *Archaeology sites present or absent
- *Recreational or commercial traffic levels
- Distance from center of navigation channel (from navigation charts)
- Land use on bank crest
  - Urban
  - Industrial
  - Agricultural
  - Wooded
  - Grasses and weeds
  - Levee
  - Railroad track

This portion of data should be developed from oblique video photography and river plan view information prior to boat reconnaissance.

*To be provided by the COE. See Item IV.

Geomorphic character
- Inside bend
- Outside bend

Straight reach
Transition reach
Island

Erosion site attributes (limited to 60 sites selected for detailed investigations)
- Failure face height
- Failure face slope
- Basal berm height
- Basal berm width
- Failure face soil type
- Basal berm soil type
- Underwater slope
- Near-shore sediment type
- Vegetation at tope of failure face
  - Wooded
  - Grasses and weeds
  - Agricultural row crops

This portion of data base should be developed during and shortly after boat reconnaissance.

This list is not intended to exclude other parameters that may become important in the classification of banks. Other parameters may be added at a later date.

Task 3. Review of Video and Available Mapping: Review the video, photographs, etc. taken by the Rock Island District during the aerial overflight. A preliminary selection of at least 60 sites for detailed study and data collection will be made following review of the aerial overflight video. These sites will be marked on navigation charts for the boat reconnaissance survey. These sites should be representative of the system based on the above classification attributes. This preliminary selection will be subject to the recommendations of the COE and the multi-discipline bank erosion committee assembled by the COE.

Task 4. Boat Reconnaissance Survey: Conduct a field reconnaissance survey by boat for the Illinois Waterway and the Upper Mississippi River. This will consist of a trip from Joliet to Grafton on the Illinois Waterway and St. Anthony Falls to Cairo on the Mississippi River. The team members will participate in this trip will be determined jointly by the contractor and the COE. The following data and information will be collected during this trip.

A. *Illinois Waterway: Joliet to Grafton (RM 286 to 0)*

A-1. The trip on the Illinois Waterway will require 6 to 9 days to complete. It will commence in Joliet, IL and conclude in Grafton, IL.

A-2. All failure and erosion sites and reach conditions on both banks of the river will be identified on navigation charts. Identification of the 20 representative failure and erosion sites will also be recorded utilizing a portable GPS.

A-3. During this trip at least 20 bank failure and erosion sites representative of the river system will be identified and about six bank and near bank soil and sediment samples will be collected at each site. The location of these sites will be based on the results of the oblique aerial video review from task 3 and the expertise of the multi-disciplinary team during the field reconnaissance.

A-4. Referenced photographs representative of site conditions consisting of slides and prints will be taken.

A-5. Field notes will be made at the 20 representative sites to indicate site features and opinions as to the probable causes of bank failure and erosion, general characteristics of the back of bank areas, bank and near bank soils, presence or absence of vegetation, location of failure and with respect to the river plan form and channel, and other pertinent information. This information will be added to the site classification data base outlined in Task 2 and will be marked on navigation charts as appropriate.

A-6. Other related information including back of bank land use will also be added.

A-7. Bank slopes at three to five locations at each of the 20 sites will be measured.

A-8. One cross-sectional profile of the river at each of the 20 sites will also be measured utilizing automated sounding equipment.

A-9. A chase vehicle will accompany the boat for its entire trip.

B. *Upper Mississippi River: St. Paul to Cairo (RM 854 to 0)*

B-1. The trip on the Upper Mississippi River, is expected to take three to four weeks. The trip will commence in St. Paul, MN, and conclude in Cairo, IL.

B-2. All failure and erosion sites and reach conditions on both banks of the river will be identified on navigation charts. Identification of the location of the 40 representative failure and erosion sites will also be recorded by utilizing a portable GPS.

B-3. During this trip at least 40 bank failure and erosion sites representative of the river system will be identified and about six bank, and near bank soil and sediment samples will be collected at each site. the location of these sites will be based on the results of the oblique aerial video review from task 3 and the expertise of the multi-disciplinary team during the field reconnaissance.

B-4. Referenced photographs representative of site conditions consisting of slide and prints will be taken.

B-5. Field notes will be made at the 40 representative sites and indicate site features and the probable causes of bank failure and erosion, general characteristics of the back of bank area and banks and bank soils, presence of absence of vegetation, location of the failure and erosion with respect to the river plan form and channel, and other pertinent information. This information will be added to the site classification data base outlined in Task 2 and will be marked on navigation charts as appropriate.

B-6. Other related information including back of bank land use will also be added.

B-7. Bank slopes at three to five locations at each of the 40 sites will also be measured.

B-8. One cross-sectional profile of the river at each of the 40 sites will also be measured utilizing automated sounding equipment.

B-9. A chase vehicle will accompany the boat for its entire trip.

Task 5. Site Selection for the Detailed Traffic Impact Study: The contractor, with assistance from the COE and the multi-disciplinary team, will recommend at least five representative sites for detailed field data collection on the impacts of traffic on bank failure and erosion. Of these five sites, two will be from the Illinois Waterway and three from the Upper Mississippi River. These detailed experiments are not included in this scope of work.

Task 6. Meetings: The contractor will hold meetings with the COE on a regular basis to inform the COE on the progress of the project. these may include: One initial meeting with the entire reconnaissance team to plan the details of the reconnaissance trip; one meeting just prior to the reconnaissance trip to discuss the results of the oblique video review, initial data base development and sites selected for detailed site investigations; three meetings during the preparation of the report at 50 percent, 80 percent and 95 percent completion and; one final meeting for final project and report presentation.

Task 7. Submittals

1. Maps and Photographs: Five sets of selected photographs from each of 60 selected sites and five sets of color coded navigation charts showing bank erosion site locations and other pertinent information. This will also include the 5 sites selected for field experiments (Detailed Traffic Impact Study).

2. Data Base: An electronic data base file containing all bank erosion classification system attribute data outlined in Task 2 for the 60 sites selected for detailed studies will be submitted in a comma-delimited ASCII file to the COE.

3. Report: At the end of this project, a report will be prepared and submitted to the COE containing the following information.

- Review of historical and technical information.
- Review of oblique video photography and available mapping.
- A detailed description of the classification system and resulting attribute data base development.
- Report of reconnaissance by boat including a detailed description of each of the approximately 60 sites selected for detailed investigations.
- Opinions as to initiating bank failure and erosion mechanisms and processes.
- Description of the sites selected for detailed observation and evaluation including sites for detailed experiments, and reasons why those sites were selected.
- Opinions regarding the relative significance of bank failure and erosion mechanisms and navigation (both recreational and commercial) effects on bank erosion and failure.
- An appendix where all the relevant data are to be included.

The draft report will be subject to review and comment by the same multi-disciplinary bank erosion committee assembled by the COE and the contractor prior to final printing. Ten copies of the final report will be submitted to the COE.

IV. Hydraulic and Other Data:

The COE will provide the following information for all the selected sites as needed, and if available: stage hydrographs; discharge hydrographs; velocity measurements; stage-duration diagrams; discharge-duration diagrams; discharge rating curves; sediment rating curves; precipitation cumulative departure information; historical and recent waterway improvement and operational changes; navigation traffic statistics; typical tow sizes; towboat horsepower ranges; transitions; fleeting and mooring area references; data on all bank protection projects; recreational boating statistics; and archaeological sites. A set of Regulation Manuals for all of the locks and dams on both rivers will be provided to the contractor by the COE at the initiation of the contract. These manuals contain much of the above listed information. Eight sets of navigation charts for each river will be provided to the contractor.

V. Equipment and Support Materials to be Provided by the Contractor

The Contractor will provide necessary equipment for these reconnaissance and detailed site inspections. At a minimum this will include:

- A 35 to 40 foot field boat with large river data collection and storage facilities and one 18 to 20 foot field boat for collecting near-shore data.
- Boat crews and operators.
- A hand-held GPS, accurate in the range of 10 meters.
- Soil and sediment sampling equipment.
- Surveying Equipment (hand held levels, level rods, chains, tapes)
- Vehicles, drivers, etc.
- Cameras and film.
- Field supplies, equipment that will be needed to gather, store, and/or analyze the data and samples that will be collected during these reconnaissance and site inspections.

VI. Schedule

The timing of individual tasks will depend on the availability of the oblique aerial video photography to be taken by the COE. The reconnaissance trip schedule is also dependent on when the water level in the rivers is low enough to evaluate and record the bank failure and erosion sites. This portion of the project will be complete by the end of July, 1996.

VII. References Cited

Bhowmik, N.G. and R.J. Schicht. 1980. *Bank Erosion of the Illinois River*, Illinois State Water Survey Report of Investigation No. 92, Champaign, IL.

Bhowmik, N.G., A.C. Miller, and B.S. Payne, 1990. *Techniques for Studying the Physical Effects of Commercial Navigation Traffic on Aquatic Habitats*, Technical Report EL-90-10, Department of the Army, Waterways Experiment Station, Vicksburg, MS.

Hagerty, D.J. 1988. *Report on the Illinois Waterway Bank Evaluation*, Department of Civil Engineering, University of Louisville, submitted to the U.S. Army Corps of Engineers, Rock Island District, June 25, 1988.

Maynord, S. and S. Martin. 1995. *Upper Mississippi River System Bank Erosion Literature Study*, Draft report prepared for U.S. Army Corps of Engineers, Rock Island District, St. Louis District, and St. Paul District. U.S. Waterways Experiment Station, Vicksburg, MS.